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ON SOME OF THE FORMS
OF
DISEASE OF THE EYE.

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OF
DISEASE OF THE EYE,
CONSTITUTING THE CONDITION
COMMONLY CALLED AMAUROSIS.

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THIS paper was read at the Harveian Society during the current session. I was requested by some of the members present to print it. I have done so, in the hope that it may be serviceable in drawing attention to some of the practical uses of the ophthalmoscope ; and especially to the importance and facility of diagnosing and treating the early stages of those deep-seated diseases of the eye which commonly manifest themselves at the outset by shortness of sight or dim sight, and are often overlooked for years, until they become incurable, and end in amaurosis. I have been careful to give the general as well as the ophthalmoscopic symptoms.

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THE term amaurosis has been commonly applied to that kind of disorder of the sight in which the eye of the patient undergoes little or no change apparent to the ordinary vision of the beholder. The one symptom common to this class of diseases of the eye is more or less of blindness. The number of persons who become totally blind without any external change in the eye has always been very considerable. Unfortunately, the forms of disease thus producing blindness are by their very nature severe and insidious, and not so easily amenable to treatment as those which affect

the front of the eye. But no small part of the difficulty of the surgeon, as of the despair of the patient, has been due to the fact that the nature of the changes ending so disastrously could not be ascertained during life; and, so far as it could be inferred at all, that inference was due to collateral circumstances, and was, in the majority of cases, little better than a bad, because an imperfectly founded, guess.

Since by the use of a pierced mirror we have learnt from Helmholtz how to place ourselves in the path of the rays of light emerging from the eye which we wish to observe, and thus to catch the image of the retina, of the choroid showing through the retina, and of the choroidal and retinal arteries and veins, we have been in a position accurately to observe those changes which were before only guessed at during life, and imperfectly interpreted after death.

The immediate result of ophthalmoscopy has been to show us that amaurosis is not one or two diseases, but a great many; or rather, that it is a symptom binding together a considerable variety of morbid conditions; conditions so various, that treatment which would benefit the one would greatly injure the other; so complicated, that many years will be needed fully to unravel their separate pathology; but yet so positive in their

signs, that they may be read off with ease and precision by any one who will take the trouble to learn to use the art of inspecting the resplendent fundus of the eye.

As the purposes of the Harveian Society are mainly those of practical medicine and surgery, I thought that, in responding to our Secretary's request to take my turn in contributing a subject for discussion at the sessional meetings, I could not do better than give a brief account of some of these morbid changes, as the ophthalmoscope enables us to detect them in practice, indicate the methods of treatment which I habitually employ in some of them, and, at the same time, present for your observation, with a demonstrating ophthalmoscope, such as I use for the instruction of the pupils at St. Mary's, a few illustrative and typical cases which I happen to have at the moment under observation.

The subject is already so large, that I cannot attempt to condense all I have got to say upon it within an hour's reading. I should be able to present to you only a skeleton catalogue of pathological conditions and therapeutical formulæ. I have, therefore, resolved rather to offer to-night a commentary on one or two only of the more frequent forms of deep-seated disease of the eye, such as every day call for recognition and treatment in

the course of ophthalmic practice. I have selected a few patients out of those actually in attendance at St. Mary's, for a sort of clinical conference upon their cases.

I pass over, at present, any details on the best form of ophthalmoscope and the manner of using it, as foreign to the immediate subject of the paper. Setting to work at once to examine, ophthalmoscopically, a series of patients who are more or less blind through the progress of disease situated behind the iris, I will enumerate a few of the changes which we most commonly find, and speak of the manner of treating them.

In order to appreciate those changes, it is, of course, necessary to bear in mind what is seen in a state of health. This, therefore, I would briefly recapitulate. The first thing seen is the red reflection of the choroidal vessels, showing through the translucent retina; and when the eye observed is directed upwards and inwards, we see the usually circular disc of the optic nerve cream-coloured, or very faintly roseate or grey, and surrounded by the red choroid. From out this disc we see springing the retinal artery and retinal veins. These divide into a superior and inferior branch, each of which subdivides forthwith into two secondary branches, and so on, running side by side. The arteries are easily recognized as being some-

what smaller in calibre and of a brighter red than the veins; and in the veins a slight pulsation may frequently be detected in normal eyes, if it be carefully looked for at the site of the papilla, where the veins are largest, and just as they pass over to enter the nerve. The pulsation is detected by watching carefully the colour of the veins, which may be seen to become fainter, and again will darken; and when the pulsation is very evident at this point, the little mass of blood may seem to move backward and forward. I am not here describing minutely the physiological appearances of the normal eye, for this would take up too much of our time and lead away from the prescribed object of my paper; but it is obviously a matter of the first importance to become acquainted with natural appearances, before assuming to diagnose the character of their changes in disease; and this pulsation of the veins is distinctly a physiological phenomenon, to which I have observed that a pathological importance is sometimes attached in error.* The arterial pulse, on the other hand, may be considered as indicative of undue pressure, and ranked as a pathological phenomenon.

In the normal eye the aqueous humour, lens,

* I observed it very strongly lately in a lady sent to me by Dr. Tanner, who was simply anæmic from hæmorrhages.

and vitreous humour are clear, and do not in any way obstruct the passage of the light.

Taking up now the diagnosis of the various forms of disease, any of which would have been held to constitute the condition known as amaurosis, it may be noted, first of all, that even in the hands of the novice, ophthalmoscopic examination supercedes those chapters in ophthalmology which were formerly devoted to the means of distinguishing between incipient cataract and amaurosis. In the past, and even at present with those surgeons who are content to treat deep-seated diseases of the eye by guessing at their nature, and have not adopted the systematic use of the ophthalmoscope into their practice, the functional annoyances which commonly occur at the outset of the formation of lenticular cataract have been and are fertile sources of deception. The patient complains of frontal pain, of confused vision, stars of light, and some other vague symptoms which characterize the outset alike of many forms of deep-seated disease of the eye, and of the fatty degeneration of the lens which commonly gives rise to lenticular cataract, probably from coincident swelling of the lens. An error arising from this source has many times condemned the unfortunate subject of a commencing cataract to the severe treatment thought appro-

priate to the unhappy class of amaurotics. The kind of alteration in the lens imperceptible by any other means than the ophthalmoscope, is the slightly opaque striation of the substance of the lens sometimes seen in an early stage. These striæ may occupy either the anterior or the posterior segment of the lens, and spring from the centre of the crystalline, or converge towards the centre from the circumference. In order to see the latter, the pupil must be fully dilated with atropine; as, indeed, for the purposes of complete ophthalmoscopic examination it always needs to be;* and then, just as the greatest expert cannot discover them except by ophthalmoscopic illumination, so neither with its aid can they be passed over with ordinary care. In order to be quite sure in any delicate case, it is well to lower the light a little, and use only a feebly illuminating power, as a very strong light may overpower a commencing opacity, and render us unable to detect the striæ. This practical caution applies equally to all other conditions of opacity

* Messrs. Savory and Moore have recently prepared for me thin sheets of gelatine, impregnated with atropine in such proportions that a small fragment (about one-tenth of an inch square) contains $\frac{1}{100000}$ of a grain. This minute dose suffices to produce complete dilatation of the pupil, but barely affects accommodation. Hence the inconvenience usually consequent on the use of atropine for ophthalmoscopic purposes is abolished by the use of the gelatine.

in the transparent media. In two cases, lately, I have been able to set at rest doubts of this kind, which happened to be in the persons of medical men, who were much disquieted by the symptoms, —one a member of this Society. In a third case, I have recently detected incipient cataract (peripheral striæ) in a gentleman supposed to be suffering from commencing glaucoma.

It is of frequent occurrence to find the capsule of the lens stained with black spots: these are stains left by the uveal pigment, and occur usually after an attack of iritis, when the iris has been in contact with the lens. When the iris has been adherent, a complete ring of pigment may often be seen on the surface of the lens. A day's experience at any ophthalmic clinique can mostly show examples of this condition; but it is only when these deposits are numerous, and in the central line of vision, that they become troublesome. They are then met with as the sequences of severe choroido-iritis, and usually coincide with further mischief in the vitreous and choroid.

The vitreous, under the influence most commonly of choroiditis, and usually syphilitic choroiditis, presents alterations of the most striking character for ophthalmoscopic observation. The patients who offer these changes complain usually of considerable dimness of sight, which on exami-

nation is found to include both diminution in the acuteness of visual perception, and restriction in *the field of vision*, or extent of any object seen at once. The great source of trouble to them is, that when they lift the eyes or move the head, black corpuscles, or streaks, or webs, float before their eyes, and obscure the objects at which they are looking; and when the eyes are kept still, these fall again and disappear. Examine now the eyes of such an one, and you will see that the phenomena described are due to the existence of actual shreds, corpuscles, or webs of fibrous and albuminous exsudation, which float in the vitreous, and at each motion of the eye rise in clouds and obscure the fundus, so that you can barely see it, or perhaps not at all. These conditions, I say, are mostly syphilitic, but not invariably. They are sometimes the result of scrofula, and probably of other forms of choroiditis. Some well-marked examples of each kind are at the present moment under my care; and I have asked the patients who present these conditions to attend to-night, in order that those who care to do so may see them under the ophthalmoscope. The prognosis of these cases is not very unfavourable; they are amenable to treatment, and commonly improve under it. I will give one or two illustrations of this common form of amaurosis.

October 14th.—E. H., aged 25, sent to me by Mr. Wall. Aspect of eye normal; apparently a healthy man. Complains that for some time—about four months—the sight had been growing dimmer, and lately the right eye had grown so dull that he could only see as through a thick cloud; and if he attempted to read, or to look at small objects, they seemed double to him. He saw constantly black specks in the air,—one especially constant in position, and always present. There is no squint or head symptom. The pupil acts pretty well in the right eye. He stated that he knew of no cause, and had not had any illness. The pupil was dilated with atropine for the purpose of ophthalmoscopic examination. It was then observable that the dilatation was not complete, but that in three places the iris was tied down to the lens. Ophthalmoscopic examination showed the lens to be stained with a multitude of black spots, pigment deposited by the adherent uveal coat of the iris, and the vitreous so clouded that the fundus could only be seen very imperfectly, and the details of the choroid and papilla were masked. Some black shreds floated about in the vitreous chamber. He was then closely questioned as to his former history, and admitted that, some two years before, he had contracted syphilis, and had

a small sore on the penis. He said that he had never had any eruption or sore throat.

Atropine drops were ordered to be used alternately, with the solution of the calabar bean, in order to break down the existing adhesions as far as possible.

And iodide of potassium, in mixture, three times a day.

October 30.—He had continued to use the iodide of potassium, and says that the cloud is now decidedly thinner, and he can see objects more distinctly. His sight is now greatly improved, and his symptoms have disappeared under the above course of treatment.

A very similar case presented itself the same day at the hospital, in the person of a young man from Nottingham, sent up to me by his employer. He told me that his sight had been good until about two months ago, when the left eye had suddenly become useless to him. He knew of no cause or reason; had received no blow on the head, and had little or no pain in the eye. The eye had not been painful, only a little uneasy. The pupil seemed to act well. He could read large type with the right eye. On dilating with atropine preparatory to inspection, the iris was found to have a posterior adhesion below, giving it a triangular appearance. A history of

chancre and secondary eruption was then elicited, three years since. The vitreous was fairly clear; but a few black cellular threads rose from the bottom of the vitreous chamber, and traversed the field of vision, as he moved the eye, in obedience to direction. The optic papilla could be clearly defined when they settled. I desired this patient to come down to the hospital in order that some of the pupils might see him, and demonstrated very clearly to them, in this case, the extreme redness of the papilla, which brought it to resemble that of the choroid, and which differs altogether from the congestive redness with full veins which marks cerebral pressure, and is found preceding optic atrophy.

This patient has returned this week to the country with greatly improved vision, having been treated by dilatation of the pupil, with alternate recontraction, iodide of potassium, and tincture of steel.

A similar case, of old standing, came under my notice this week, in the person of a gentleman, aged 37, who is a patient of Dr. Gull. Here the syphilitic history *saute aux yeux*, as there are still local indications of constitutional syphilis in an irritable sore. He had a chancre two years since, and syphilitic "iritis." He has seen two ophthalmic surgeons in this town in the course

of two years. His eye is healthy in aspect, although the iris changed in colour; pupil contracts under light. There are two strong adhesions when dilated. He has traces of disseminate choroiditis; vitreous pretty clear. I advised a steady course of mercurials, followed by iodide of potassium; blue spectacles at night. All his symptoms have improved.

It would be easy to multiply such cases, but I will only add a reference to one in which the inflammatory changes preceding turbidity and disorganization of the vitreous are not syphilitic. This patient attends here to-night, and you will easily see with the ophthalmoscopic mirror the thick veils of reticulated tissue, which show heavily black as they move about in the vitreous. I am glad to say that the sight of the patient has improved in a marked degree, under treatment by cod-liver oil and iodide of potassium internally, and iodide of potassium locally applied so as to be absorbed endosmotically into the anterior chamber.*

Intimately connected with this condition of the vitreous in the relation of cause to effect, are in-

* The prognosis of these cases is good. One of considerable interest has just come under my notice, in the person of a gentleman who is a patient of Mr. Walter J. Coulson, where the importance of being able to define the disease and give a favourable prognosis was very great.

flammatory affections of the choroid coat of the eye. Here we reach a large mass of amaurotic cases, presenting an infinite individual variety, and each case requiring to be studied separately, in order to spell out its history, on which altogether depend diagnosis, prognosis, and treatment. The greater number, indeed, of the obscure affections of the eye resolve themselves under the ophthalmoscope into results of choroidal diseases, and rarely, except in instances of optic atrophy, is any case free from choroidal implication. But if the conditions of choroidal disease form the most numerous and important class of cases of defective vision, fortunately also they are the most hopeful, and can be most effectively submitted to treatment.

For our practical purposes, the various and numerous inflammatory changes of the choroid may be divided into three classes: those in which the result is adhesion of the retina, from its being included in the inflammatory changes of the choroid; those of effusion beneath the retina, detaching it from the choroid; those characterized by adhesion of the choroid to the sclerotic, inflammatory changes occurring in both, with resulting atrophy. The last is the most frequent condition: indeed, it is frequent beyond what might be credible, but for the positive evidence of the ophthal-

moscope. It makes up a very large percentage of the cases of defective vision from deep-seated causes which come before the ophthalmic surgeon; and it exists unnoticed, neglected, or maltreated in so large a number of cases in general practice, that it is an especial object which I had in view to-night, to ask some general attention to this condition by surgeons who do not profess ophthalmology especially, or employ habitually in practice the means requisite for inspecting the fundus of the eye.

In the stage in which this disease usually comes under notice, we notice, on looking to the optic disc—the first thing which one does look to in an ophthalmoscopic examination,—that around its outer, or lower and outer part, instead of the normal red reflection of the choroid, there is a white patch, crescentic first in shape, but in advanced conditions irregularly shaped, and, as it progresses, very many sharp, angulated processes, showing a black augmented edge, entirely or in patches. This appearance is due to atrophic change of the choroid and sclerotic, following chronic inflammation: the thinned and weakened choroid and sclerotic, yielding partly to intraocular pressure and an increased secretion of fluid within the eye at this point, are pushed backwards, and form a posterior staphyloma or projecting pouch. This

elongation of the dimensions of the eyeball is attended, of necessity, with short-sightedness: and *increasing short-sightedness is one of the earliest and most palpable warnings of the first stages of the disease.* If this warning is misinterpreted, and the increasing shortness of sight is met, as is too often the case, by the employment of concave lenses of proportionately greater power, the progress of the disease is hastened by the very means which palliate its inconveniences. In many cases, indeed, the disease after reaching a certain point will be stayed, and excessive shortness of sight will be the principal inconvenience for many years. But in many others, the changes extend till they reach the yellow spot; or a fresh and distinct focus is set up at that point, and then the retina is seriously involved, though in the first stage it is little affected. The retina does not adhere to the staphylomatous projection, although following it, and it really lends itself to that degree of distension which it suffers with singular facility. On the other hand, as the yellow spot becomes implicated, the retina at this point, one of the highest visual value, suffers, for here it is thinnest and can least endure the stretching. Then serious dimness of vision is added to the myopia. Presently follow a train of consequences which end in various forms of blindness, the complete

amaurosis of former days. The retina participates in the atrophic changes of the choroid, and becomes infiltrated with pigment; the vitreous body becomes fluid, either posteriorly or altogether; and hæmorrhages from the choroid occur, with retinal perforation. From this source spring the opaque flaky substances which may be seen in such cases floating in the vitreous. The more fluid the vitreous, the more freely they float; the nearer the posterior part of the vitreous, the more they interfere with the vision, and the greater the chance that, by adhering to the retina, they may in their subsequent degeneration and contraction cause detachment of the retina. If the sclerotic be rigid and will not yield to the increased intraocular secretion of fluid, the pressure will produce excavation of the optic nerve and chronic glaucoma. Finally, the case may advance till the increasing secretion and unnatural distension of the eyeball produce true and total dropsy of the eye, with destruction of the sight, pain, and great deformity. In this naked summary of the disease in question, I am sure that I am not at all overstating the gravity of its consequences. I have my mind fixed upon cases, of which I will briefly refer to one or two typical ones illustrating all the facts; and their importance rests mainly in this,—that when the patients arrive at the later

stage, when the eye has become truly amaurotic, when the retina is extensively detached, atrophied, and pigmented, their state is nearly hopeless. But it is not so in the early stage, which is a condition so common that I have seen three cases to-day,—one in a patient sent to me by Mr. Solly, whom I have saved from certain blindness in the future by counselling total abstinence from his present commercial pursuits, and resort to agricultural life; and two in the young females who have come as patients to the hospital, and whom I submit for your examination to-night.

Treatment.—In the first place, the use of concave glasses should be abandoned for reading, writing, sewing, or the examination of near objects generally. If possible, they should be totally abandoned. Patients who have already become very short-sighted by the progress of the disease, cannot abandon the use of some kind of glass for distant objects; but in order to check the use of lenses, it is well to forbid the use of any spectacles or eye-glasses, and to recommend them to carry some form of pocket-glass such as opticians make. There is frequently a degree of sensitiveness to light, and this indicates the use of tinted (plane) spectacles. The ordinary smoked glasses may be advantageously substituted in such a case by those tinted of a cobalt blue, which

sufficiently exclude the irritating yellow and red rays without cutting off too much light, or producing an unpleasant obscurity.

Local depletion of the congested choroid is highly useful: after the judicious application of this means, the immediate benefit is often marked. I have for some time used for this purpose the kind of cupping apparatus known as the artificial leech, or that which I employ at St. Mary's, and in my private practice. This acts far better than ordinary cupping or leeching on the temples, and for obvious reasons. It consists of a small silver exhausting cylinder, combined with lancets, which may be set to any required depth, and released by a spring. Over the incisions thus made, a glass exhausting cylinder is then immediately applied, and by withdrawing the piston, a dense mass of blood rising, is drawn with much power of suction. It is this power of deep suction which seems to give this apparatus, which is otherwise very clean, expeditious, and convenient, its advantages for unloading the choroidal vessels, and relieving deep-seated congestions of the eye. The effect of this energetic action and rapid depletion is very satisfactory, and immediate improvement in the reading power succeeds the application. It is best to do this at night, and to keep the patient next day in a shaded room, as

a strong light, immediately after, may produce renewed congestion, and undo much of the good done.

The cold douche is a useful adjunct to the eye ; and when, as often happens, the eyeball is full, prominent, and tender, cold applications are useful. An evaporating lotion, made with the liquor of acetate of ammonia, glycerine, and rose-water, is an agreeable form of cooling lotion, which may be applied on linen rag laid over the eyes, or with a soft small sponge. The bathing the eyes with cold water should be a regular part of the daily toilette.*

Mustard baths to the feet, and dry cupping to the nape of the neck, are also useful.

When the disease progresses rapidly, more active treatment is necessary: diuretics and sudorifics, saline purgatives, and iodide of potassium (in chronic choroiditis) are the most useful elements in medication. The guarding of the eye from yellow light, and prohibition of employment in reading, writing, and sewing, are essential. Many an eye has gradually lost all useful vision from persever-

* An exquisite form of douche is that afforded by the various apparatus for "pulverising" water. Luër, of Paris, has a simple form of syringe, which affords a refreshing shower of this kind. It is also supplied by Messrs. Savigny and Co., of St. James's Street. Savory and Moore have a very excellent eye-douche.

ance in efforts at accommodation, to which it is no longer equal, and persistently employing glasses in the contest with nature.

For the complications separate treatment is necessary, which it would be long to detail; hence the necessity for careful surveillance of a patient in whom shortness of sight is rapidly progressing.

When diminution of the field of vision exists already at the time that the patient comes under the notice of the surgeon, and the ophthalmoscope shows glaucomatous excavation of the pupil, or flaky bodies in the vitreous, excision of a portion of the iris is necessary (Gräfe). In the majority of cases, even at this stage, the progress of the disease may thus be arrested. When the lens has become opaque, extraction becomes necessary; and it will need to be modified in its details by the knowledge of the circumstances that have preceded. Extraction in such cases offers, of necessity, far less favourable prospects than in cases of simple, uncomplicated cataract. But if the surgeon know the state of things beforehand, he can so provide for them, by modifying his operation, as to attain a large share of success. If the patient be brought under notice first in this final stage, it will still be in his power, by accurate estimation of the quantitative

perception of a standard body of light, the investigation of the phosphenes,* and the determination of the state of tension of the eye, to form an opinion of the retinal perceptive power and the condition of the vitreous.

Other forms of choroiditis deserve great attention, especially plastic exsudative choroiditis and general or disseminate choroiditis. Both of these are commonly syphilitic in their origin; and when impairment of reading power or otherwise defective vision occurs in the case of a person who has at any time been afflicted with constitutional syphilis, the ophthalmoscopic examination of the eyes can never be omitted. The remedies are much the same as that which I have above indicated, together with a specific treatment,—mercurial inunction, the vapour-bath, or the careful administration of bichloride of mercury with iodide of potassium or ammonium.

Finally, I would draw attention to the details of the case of a patient whom I submit to-night to ophthalmoscopic inspection by the Fellows present. It will be observed that the eyes of this patient present externally no abnormal appearance whatever: the general health of the patient is perfectly

* I have described this method of investigation in its relation to cataract, in some papers on Clinical Ophthalmic Surgery, *Lancet*, vol. ii. 1862.

good, and he has never had a day's illness since childhood. He presented himself to me a few days since, under the following circumstances. He has for many years had what he calls weak sight. Since childhood he has not been able to see distinctly at night; and of late years he has found that gradually his field of vision has diminished, and also the acuteness of his sight. He has been regularly treated, by tonics and cold douches to the eyes; has worn glasses, &c.; but has never been examined with the ophthalmoscope. At present he cannot see his way about well at night, can barely discern large objects, and is not safe in walking about in London, or in the country, unless along a road which he knows very well. I tested the nature of the defect in his vision, and found that it consisted mainly in extreme contraction of the field of vision, and in diminished acuteness of the retinal perception. The diagram of his field of vision was marvellously restricted and irregular for the left eye; and with this eye I found that he could only just discern Jäger's largest type, and that not so as to read it correctly. The right eye is approaching the same condition. He was himself unaware of this restriction of the field of vision, until it was demonstrated by testing the eyes separately. On examining them now with the ophthalmoscope, the cause of all this was

apparent. The retina presents, as you may see with the demonstrating ophthalmoscope, a large number of black spots disseminated all over it: these consist of accumulations of choroidal pigment, which have at all these parts infiltrated the retina; between them it is transparent, and you may see the choroid yellow in patches from fatty degeneration, and in patches uniformly scarlet from static congestion. This is a rough picture of the condition which has been called pigmentary retinitis; but as the mischief seems very clearly to originate in the choroid, and the retina seems to suffer mainly from infiltration of the accumulated pigment, it will probably be more properly designated pigmentary choroiditis, or choroiditis with retinal pigmentation. The etiology of this remarkable affection, only known to us of late years, is still doubtful. In this patient I do not find, by careful inquiry, that there is any ground for believing it to be hereditary, or connected with consanguineous marriage; as Dr. Liebreich, who has collected a considerable number of cases, among deaf-mutes the offspring of consanguineous union, has suggested from the results of his inquiries. It seems to me, however, to be a case well worthy of your notice, as affording a marked illustration of the extent of change which may go on slowly, insidiously, and painlessly at the back of the eye, without any apparent change

in its external aspect, and without exciting alarm or suspicion in the mind either of the patient or his medical attendant.

This disease has been progressing for about eighteen years. The patient is now twenty-seven years of age; and I think the prognosis is very unfavourable indeed.

If the inspection of this and the other cases of posterior staphyloma, commencing cataract, and optic atrophy, which I present to your notice to-night, shall induce you to assent to the proposition that the study of the individual varieties of deep-seated change is essential to the conscientious treatment of all those diseases of the eye where dimness of sight is not obviously and wholly referable to external changes or defect in the dioptric apparatus, the main object of my paper will be accomplished. The use of the ophthalmoscope is not difficult, *if time and patience be given to it*. At first it is tiresome to use it; but it will afford me pleasure to assist in smoothing these difficulties to any of the members of this Society who will do me the honour to attend my clinique at the hospital; and I shall be happy to initiate them into the first steps towards employing a means of diagnosis which is one of the highest acquisitions of modern surgery, and to which we shall owe in the future the salvation of sight for many thousands who must else have lapsed into blindness.

P O S T S C R I P T.

I have been requested to add a few plain and concise directions for the use of the ophthalmoscope.

Ophthalmoscopic examination may be made in various ways, but for the present purpose it will suffice to describe the most common and useful,—that by means of the concave mirror with central aperture and biconvex glass. To use this, the surgeon darkens the room, places a light (white flame of an oil-lamp or Argand gas-burner) by the side of the head of the patient, on the level, and near to the eye to be observed. He throws that eye into shade by a small lateral screen fitted to the lamp; or, better, the patient holds his hand by the side of the temple; the surgeon seats himself in front of the patient, or stands bending towards him, so that his eye is on a little higher level than that which he is inspecting. He then places the mirror in front of his eye, resting it against the upper border of the orbit, and by a slight movement inclines the mirror a little, so as to throw the reflected light of the lamp on the eye observed, and looks through the central aperture of the mirror. He knows that he has succeeded, by seeing

the pupillary space, hitherto dark, assume a light red colour, due to the general reflection from the choroid. He takes, then, the biconvex lens with both hands, and holds this at from an inch and a half to two inches and a half in front of the eye observed in the path of the reflected rays. And now he sees strongly the brilliant reflection of the fundus of the eye; but, in order to trace its details, he must so apportion the respective distances of the mirror and lens from the eye as to catch precisely the aërial image of those parts. The distance at which the head applied to the mirror is to be held varies: twelve to eighteen inches is the average. A few words to explain the theory of this will make the practice easier. If a light be held opposite to the eye, so that its rays enter it and impinge on the retina, a great number of those rays are reflected from the fundus, and form an aërial image of it. If we could place our eye in the path of these emergent rays, we should behold this image of the fundus; but as our heads are not transparent, but, on the contrary, highly opaque, the head interposed between the light and the observed eye stops the illumination of it. To overcome this, then, the light is placed by the side of the eye to be observed, and a concave reflecting mirror is used: a pencil of light is thus thrown forward, and the eye of the observer being placed at the central aper-

ture, is in the path of their emergence, and in a position to catch the aërial image. But, to do this, he must be at the right distance, that is, at the part where it is placed in air. Now this obviously differs for every eye, according to the refracting powers of the lens and other media, and according to the conditions of accommodation and distant vision, which vary more or less in every individual. This image (the real image) may be seen, then, at the distance of distinct vision for every eye: it is of necessity inverted. This real image is, however, somewhat confused, and therefore, in practice, we avail ourselves of a well-known optical law, by interposing a biconvex lens (collecting), which has the effect of giving a real, clear, and distinct (virtual) image, somewhat smaller and nearer to the eye, so that the mirror must be kept nearer than it otherwise would. This is the most generally useful method of ophthalmoscopic observation. After this has been acquired, others may be learnt. The difficulty at first consists in adjusting the distance of the mirror and lens from each other and the eye, which frequent trials and patience at early disappointments will secure.* It is this diffi-

* A great deal of the difficulty may be overcome by using a form of fixed or demonstrating ophthalmoscope, where these distances are fixed within the necessary range. The difficulty in popularizing such instruments as that of Liebreich arises from their high price and complicated con-

culty which wearies many with the attempt; but if it be recognized that this adjustment of distances is a matter of practice which a little patience will surely acquire, I hope that those who may have been disappointed by their past efforts will not allow themselves to be permanently discouraged. The first thing to be looked for is the optic nerve entrance; and, to see this, the patient should be directed to look upwards and inwards towards the observer's eyebrow, hair, or the top of his ear, according as may be necessary. The internal appearances have been very briefly described in this paper, and are best learnt from actual observation. It is usually desirable to dilate the pupil of the patient with atropine, and it is only after skill has been attained that this can be dispensed with. If the pupil be not dilated, the difficulties of those unaccustomed to use the ophthalmoscope are much increased.

struction. An ingenious working man (Mr. Pugh) has made for me a fixed ophthalmoscope which I habitually use for demonstrating, and with which I can demonstrate the fundus of the eye in health or disease to the most inexperienced observer. I have used it now for some years, and can recommend it. It is sold by Dixey and Sons, of New Bond Street, for about thirty shillings; and when the patient is placed, whoever looks through the mirror is in a position to judge for himself what is the state of the retina, choroid, and other structures.

